THE DELIVERY OF POTABLE WATER VIA THE INTRODUCTION OF LOW-COST HANDPUMPS: THE IDRC APPROACH

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The International Development Research Centre (IDRC), an international aid agency, was established by the Parliament of Canada in 1970 as an autonomous, public corporation. IDRC's mandate is to initiate, encourage, and support research into the problems of the developing regions of the world. IDRC sponsored projects focus on the application and adaptation of scientific, technical, and other knowledge to the economic and social advancement of those regions. Strong emphasis is given to institution building and to strengthening local research capabilities. This is accomplished by providing support to Third World scientists to carry out research projects on subjects that fall within the context of their own national priorities.

IDRC has three main program divisions: the Agriculture, Food and Nutrition Sciences Division (AFNS); Social Sciences Division; and Health Sciences Division. Within AFNS the emphasis is on crops, farming systems, and afforestation in arid and semi-arid lands. The Social Sciences Division supports research designed to improve the understanding of social and economic issues related to international development. These include: education, population, science and technology, energy, urban development, economics, and rural development. The Health Sciences Division concentrates on applied research in five broad subject areas: Water Supply and Sanitation; Maternal and Child Health; Tropical and Infectious Diseases; Occupational Health and Environmental Toxicology; and Health Operations Research.

The Water Supply and Sanitation sector of IDRC's Health Sciences Division supports research on the development, testing and evaluation of innovative, low-cost technologies and strategies for introducing these technical options to rural communities. Attention is given to developing appropriate information packages needed to fully understand, choose and utilize these options. The sector focuses less attention on the pure technological approach and more on other important variables such as social acceptance, economics, hygiene education and improved management techniques. It is believed that a greater understanding of the issues involved in the acceptance, proper use and maintenance of a technology is needed before desired outcomes can be achieved.

The sector directs its assistance to five subject areas:

1. Technology Development

Activities in this subject area involve basic and applied research on the development of low-cost, appropriate technologies such as: rainwater catchment systems; water pumping devices (handpumps, hydrams, etc.); wastewater treatment and excreta disposal methods; and, community and household water treatment and disinfection techniques. The establishment of network projects (formal and informal linkages between research groups) provides the basis for sharing relevant information and disseminating research results. Special emphasis is placed on the practical application of these technologies at the village level and on the development of strategies designed to promote community understanding, acceptance and utilization.

2. Waste Reclamation Systems:

The focus of this subject area is on the recovery and/or reutilization of valuable resources (protein, plant nutrients, combustible material, etc.) from domestic and agricultural waste. Of particular interest is research on how human waste can be made into an economic resource. The practical applications of these technologies at the village level is stressed. Strong emphasis is placed on investigating the public health aspects of waste reclamation systems such as the health implications of sewage effluent irrigation, sewage-fed fisheries, and composted nightsoil as a fertilizer.

3. Manpower Development and Training:

This subject area aims at providing support to innovative manpower development programs. It includes curriculum development activities and the introduction of specialized training courses for auxiliary personnel involved in implementing rural water supply and sanitation programs. Studies on how certain technologies can be effectively adopted (transferred)

to the village level are encouraged. Development of apropriate and effective water supply and sanitation maintenance schemes and specialized training (formal and informal) for researchers on identifying and solving environmental problems within their own cultural, technical, and economic framework are also supported. Emphasis is placed on providing practical experience and on-the-job training.

4. Social and Mangerial Studies:

This subject area focuses on the social, cultural, organizational, administrative and financial aspects of water supply and sanitation programs. These studies also aim at demonstrating the capacity of communities to actively participate in the planning, execution and management of such projects. The sector supports behavioral studies on water usage and sanitation practices, as well as cost-benefit and cost-effectiveness analyses. Studies on how water supply and excreta disposal technologies can be modified to be more socially acceptable when cultural attitudes, beliefs and practices are taken into account are emphasized.

5. Sanitation Impact Studies:

This subject area deals with studies which seek to assess the impact of water supply and sanitation interventions on community health. It includes field studies on assessing the impact that sanitary improvements have in reducing morbidity and mortality caused by environmentally-related tropical and infectious diseases. Of particular interest is an identification of the variables involved in the etiology of diarrhoeal disease and the development and testing of innovative intervention strategies designed to reduce the water-borne disease problem.

In fiscal year 1986/87 approximately US $23.4 million was appropriated to developing countries for project support. The Health Sciences Division (figure 1) received approximately US $8.1 million (16%). Of that amount, US $1.4 million (16%) is available to the Water Supply and Sanitation sector for research grants (figure 2).

During the first half of the International Water Supply and Sanitation Decade, from 1980 to August 1986, the Water Supply and Sanitation sector appropriated approximately US $6.1 million (figure 3) for 82 projects within seven geographical regions: US $2.6 million (42%) to Asia; US $2.1 million (35%) to Africa; US $1.3 million (21%) to Latin America and the Caribbean; and approximately US $0.7 million (11%) administered by the Head Office in Ottawa (figure 4). Within the Water Supply and Sanitation sector research activities are divided within five subject areas or subsectors, described previously. Since 1980 the majority of WSS research support approximately US $2.7 million (44%) has gone towards the development of new and improved technologies (figure 5). Of the various projects being sponsored by IDRC that fall within the subject area of "Technology Development", approximately US $1.9 million (50%) has been allocated towards research on pumping technologies (figure 6).

The International Development Research Centre has long recognized the important role safe drinking water and adequate sanitation plays in protecting the health of people in developing countries. Since 1976, IDRC has been supporting research aimed at improving water delivery systems in the rural areas of the developing world. As piped water delivery systems are a long way off in most developing countries, the development of a handpump which is low in cost, simple in design and capable of being manufactured and repaired at the village level is a priority.

Designing a handpump using polyvinyl chloride (PVC), a low-cost material readily available in many developing countries, was the focus of the first stage in the IDRC-supported research. A prototype was developed at the University of Waterloo in Ontario, Canada and tested at the Consumers' Association Testing Facility in England.

With the newly-designed pump ready to be tested in developing countries, IDRC financed first phase projects in Malaysia, the Philippines, Sri Lanka and Thailand in 1978. The overall objective of these projects was to determine

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See Annex for figures 1-6.

what modifications had to be made to the new pump in order for it to function well under varied social, environmental and hydrogeological conditions. Other objectives included: determining the durability of the pumps under actual operating conditions, the cost of producing them locally as well as the communities' capacity for maintaining the pumps at the village level. In Malaysia, the recipients of the IDRC grant were researchers at the University of Malaya working jointly with the Ministry of Health. In the Philippines, IDRC worked first with the Institute of Small-Scale Industry of the University of the Philippines and later with the Philippines Business for Social Progress (PBSP), a local NGO. In Sri Lanka, research was conducted by the Sarvodaya Movement and in Thailand the Asian Institute of Technology was the initial IDRC client later replaced by the Population and Community Development Association (PDA).

The first phase of the four projects revealed that with some adaptation (e.g. changes in the materials used) the new PVC pumps had potential for widespread use. While the first phase proceeded relatively smoothly, problems were encountered which led to a rethinking of the IDRC strategy for the wide-scale dissemination of this technology. In the Philippines, cottage industries copied the PVC pump, but were insufficiently aware of its design weaknesses. There was therefore no quality control in the final product and the pumps that were delivered failed very shortly after installation. From this experience it was learned that if the transfer of technology is to be effective, the recipients or implementors must have time to develop a thorough understanding of all aspects of its design, installation and operation. In addition, the design must be thoroughly examined through extensive field tests, and if needed, modified to take into account the shortcomings of local materials, available technical expertise and user preferences. Figure 7 illustrates this process.

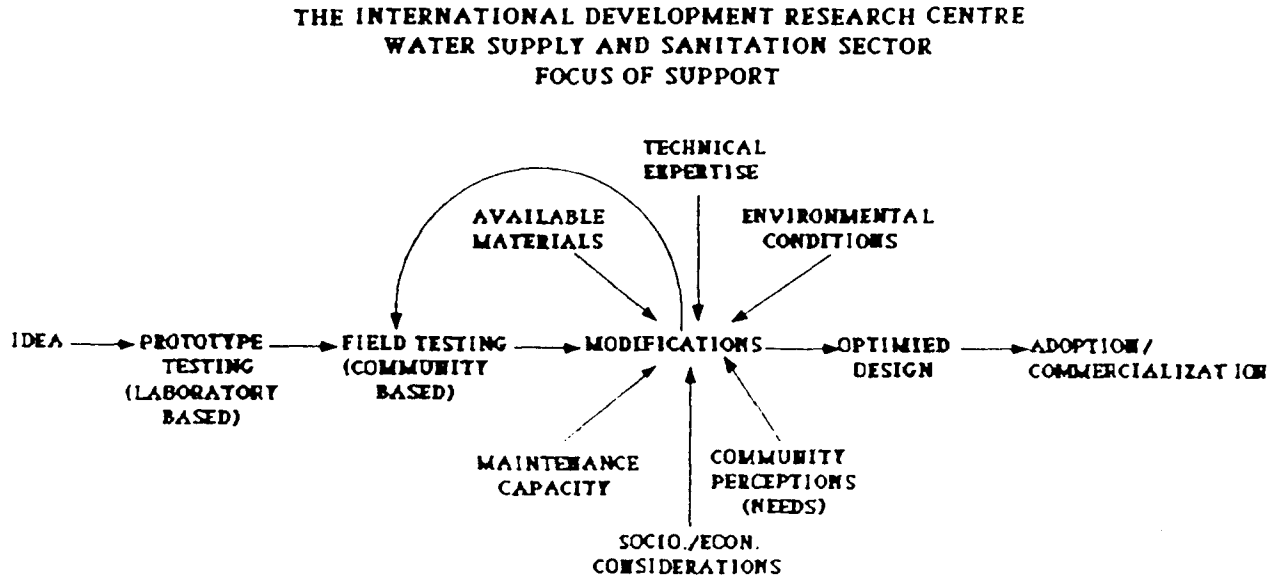


Figure 7: Process model illustrating the development and introduction of technical interventions from development to introduction.

The conclusion of the phase I projects prompted an end-of-project seminar, which was held in Kuala Lumpur; 16-19 August 1982. During the seminar project leaders presented the results of their laboratory and field tests to representatives from national, international, public and private agencies involved with rural water supplies. The results of Phase I prompted IDRC to continue supporting the research into a second phase.

In response to requests from the University of Malaya and the Ministry of Health in Malaysia, and NGOs in the Philippines, Sri Lanka and Thailand (the PBSP, the Sarvodaya Movement and the PDA, respectively), IDRC sponsored another network of research projects focusing on more extensive field tests designed to evaluate the pumps' technical performance and investigate strategies to ensure social acceptance, and develop appropriate financing and maintenance schemes. The importance of community participation in the development of new water delivery systems, was highlighted. As part of the Phase II projects, researchers consulted with villagers on the best location for the test pumps and with the help of the villagers, assessed the socio-economic implications of the new technology. Discussions with villagers allowed the researchers to design and test implementation villagers allowed the researchers to design and test implementation strategies sensitive to the concerns and needs of the local community. The results of the second phase projects are expected to be presented at an end-of-project seminar in Bangkok, October of this year.

A third phase is now being planned to bring the technology to the commercialization stage. The goal is to set up a mechanism for a self-generating handpump production and delivery system. The cornerstone of the Phase III projects will be the establishment of a Research and Training Centre in Malaysia at the University of Malaya. Such a centre will expose potential manufacturers in both the public and private sectors, as well as villagers, to all matters relating to the design, manufacture, assembly, installation and maintenance of the PVC handpump. The Centre will be equipped to carry out further research on this pump and other pumping devices, as well as serve as focal point for disseminating the technology to other countries. Safeguards to quality control and pricing guidelines will be established through licensing or franchising agreements and enforced through local consumers' associations or other similar agencies.

Figure 8 illustrates this process of technology introduction as a three-phased approach beginning with prototype development through to dissemination. IDRC believes the key element to successful introduction is the involvement of the users in the actual research. The end result must be

a technology which meets the perceived needs of the user community. It must be socially/culturally acceptable, economically viable, able to be understood by undereducated villagers, and capable of being manufactured and repaired locally with available expertise and materials.

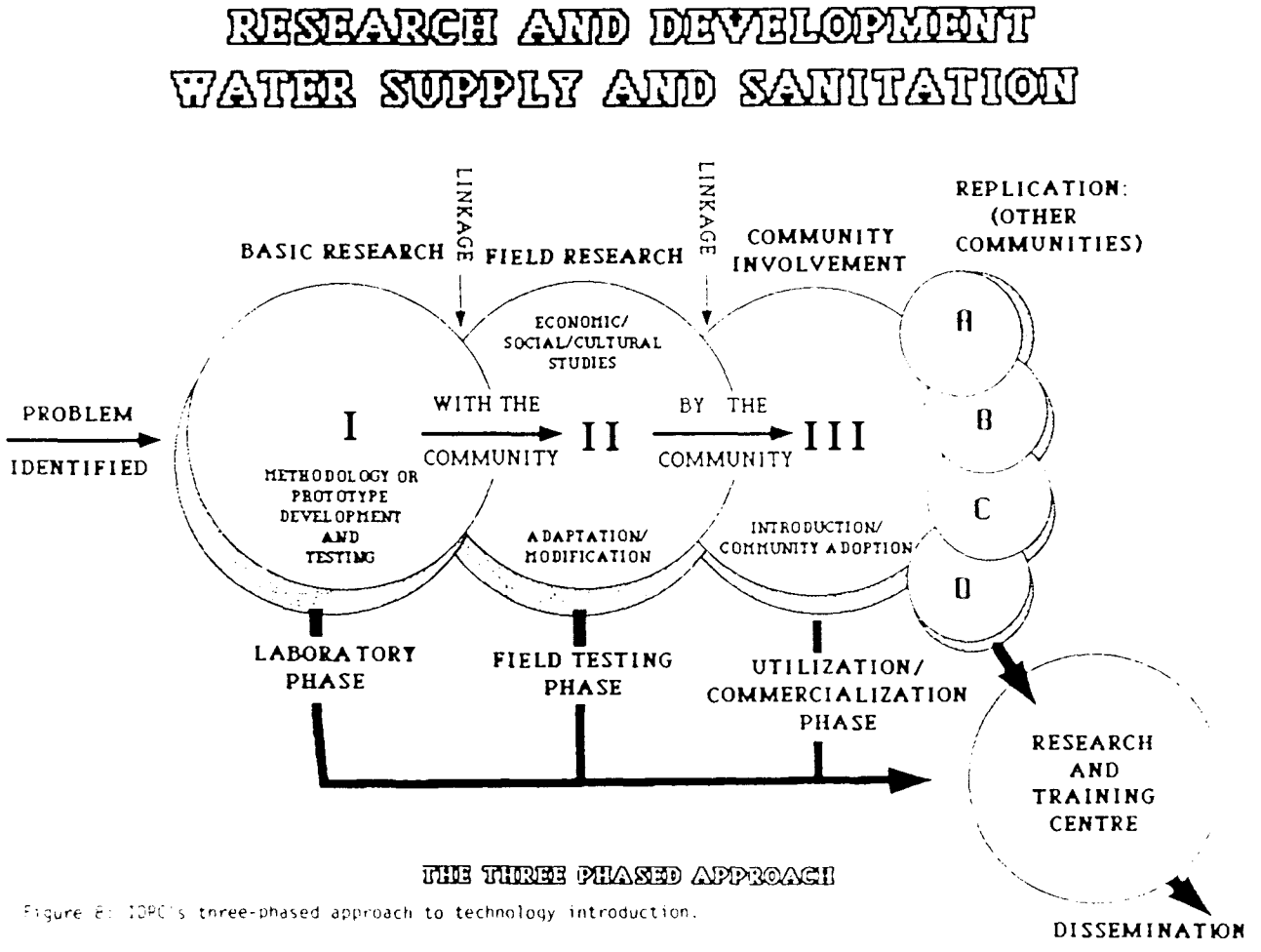


Figure 2: IDRC's three-phased approach to technology introduction.

While it is difficult to measure the impact of a process that is ongoing, some important observations can be made about the effect of IDRC-supported research in the development of improved water delivery systems in Malaysia, the Philippines, Sri Lanka and Thailand. In Malaysia, handpump research has provided an outlet for the government's commitment to improving access to clean water supplies in rural areas. The new technology has engaged the interest of the Prime Minister and mention has been made in political circles of the possibility of exporting it to Papua New Guinea.

In Thailand, individuals interested in purchasing handpumps have signed contracts and have made downpayments. The Population and Community Development Association, in addition to assuming responsibility for the social marketing and introduction of the new technology, has undertaken concessional financing arrangements with villagers and intends to begin manufacturing as part of Phase III.

In Sri Lanka, the research and development of a new water delivery system, executed by the Sarvodaya Movement - an organization committed to involving the primary users in development projects, has received global recognition. Sri Lankan women have been involved in all stages of the evolution of the handpump in that country and have gained valuable, income-generating skills. Due to this project, the role of women in what has been traditionally a male domain, has been transformed. Responsibility for the manufacture, operation and maintenance of the water delivery system by those who understand the importance of an accessible, uninterrupted water supply, may prove to be this country's key to success.

The handpump projects supported by IDRC in Malaysia, the Philippines, Sri Lanka and Thailand reflect the Centre's belief that in order for a technology to be effectively adopted it must be examined, modified, tested and maintained by its end-users. It must be noted, however, that one defining characteristic of the IDRC handpump projects in Asia is the central role played by women at each stage in the process. As a reliable source of water affects the well-being of every household, the involvement of women in all stages of its introduction deserves further attention.

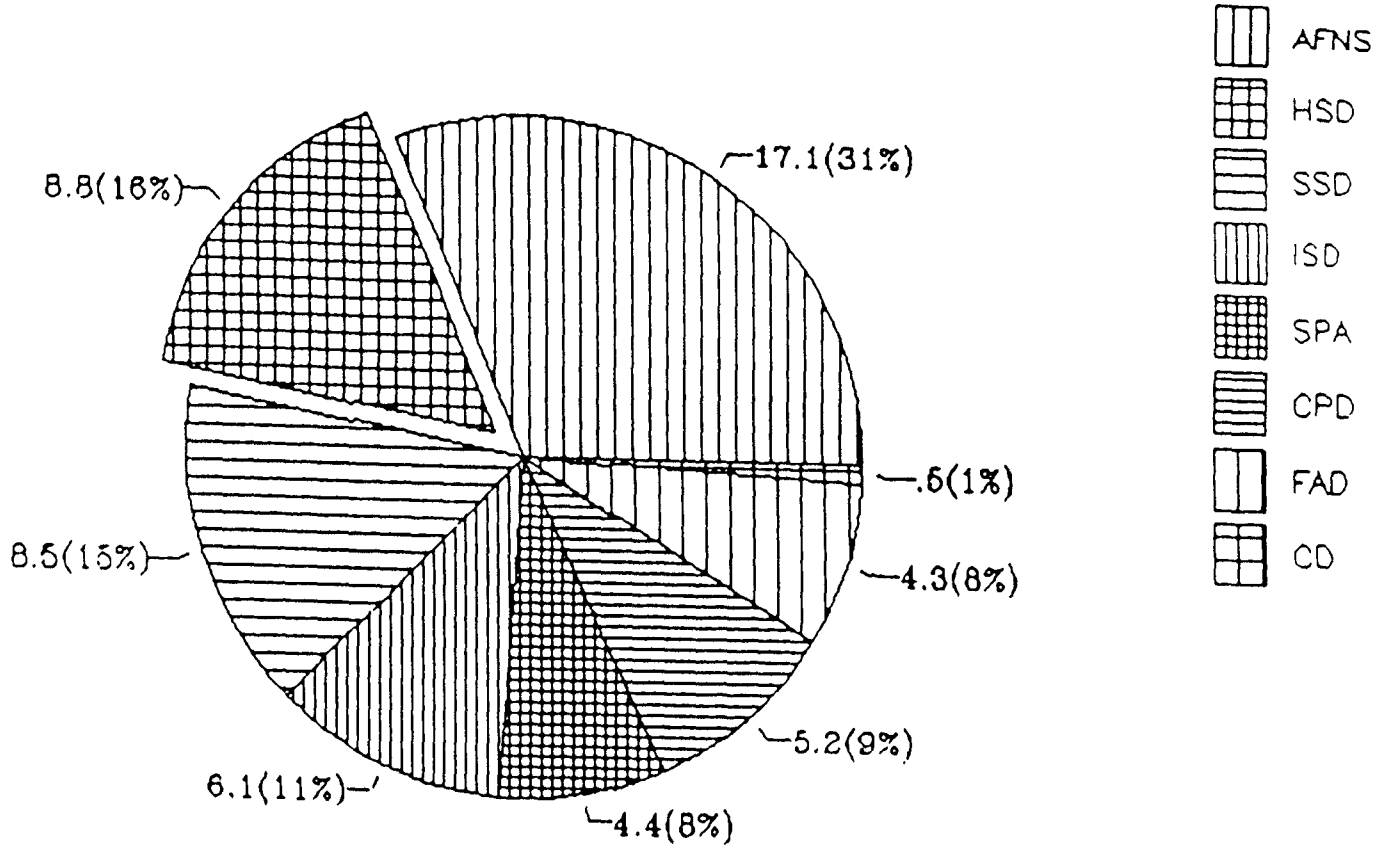
On the basis of the success of the Asian projects, IDRC is extending its support on handpump research to China, Africa and Latin America. In these regions, self-supporting training centres will be established for the further dissemination of the technology to those who need it most, the rural poor.

The goal of improving the health of rural villagers by providing them with upgraded water delivery systems is by nature a long term one. The degree to which the IDRC-supported network of rural water supply projects reached this goal will become fully apparent in the next few years.

ANNEX

INTERNATIONAL DEVELOPMENT RESEARCH CTR.

Appropriations for projects (US$ millions)



FY 1986/87

Figure 1: Appropriations for fiscal year 1986/87:to Agriculture, Food and Nutrition Sciences (AFNS); Health Sciences Division (HSD); Social Sciences Division (SSD); Information Sciences Division (ISD); Special Program Activities (SPA); Cooperative Programs Division (CPD); Fellowships and Awards Division (FAD); and the Communications Division (CD).

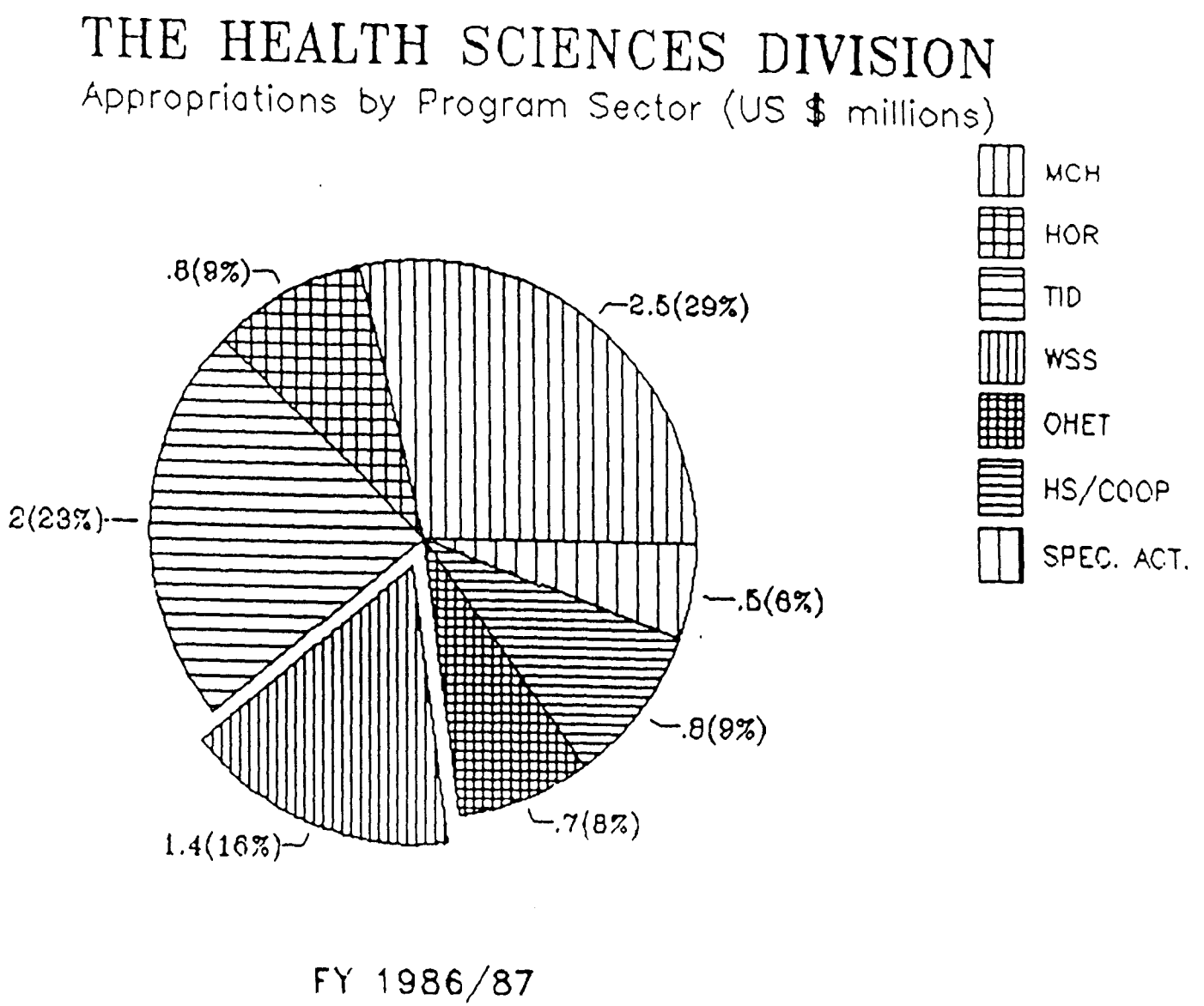


Figure 2: Appropriations for fiscal year 1986/87 to the five program sectors of the Health Sciences Division: Maternal and Child Health (MCH); Health Operations Research (HOR); Tropical and Infectious Diseases (TID); Water Supply and Sanitation (WSS); Occupational Health and Environmental Toxicology (OHET); Health Sciences/Cooperative (HS/COOP); Special Activities (SPEC. ACT.).

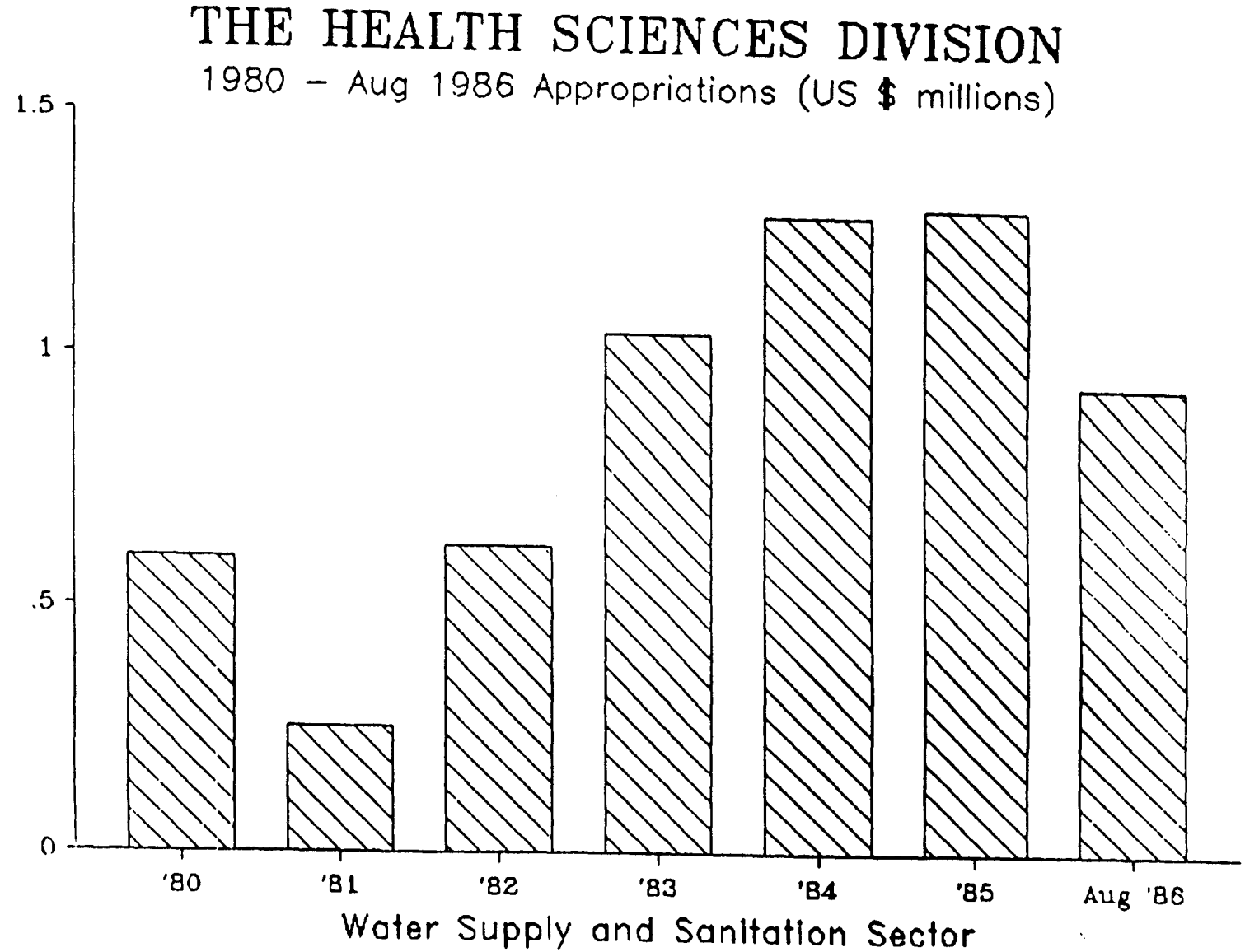
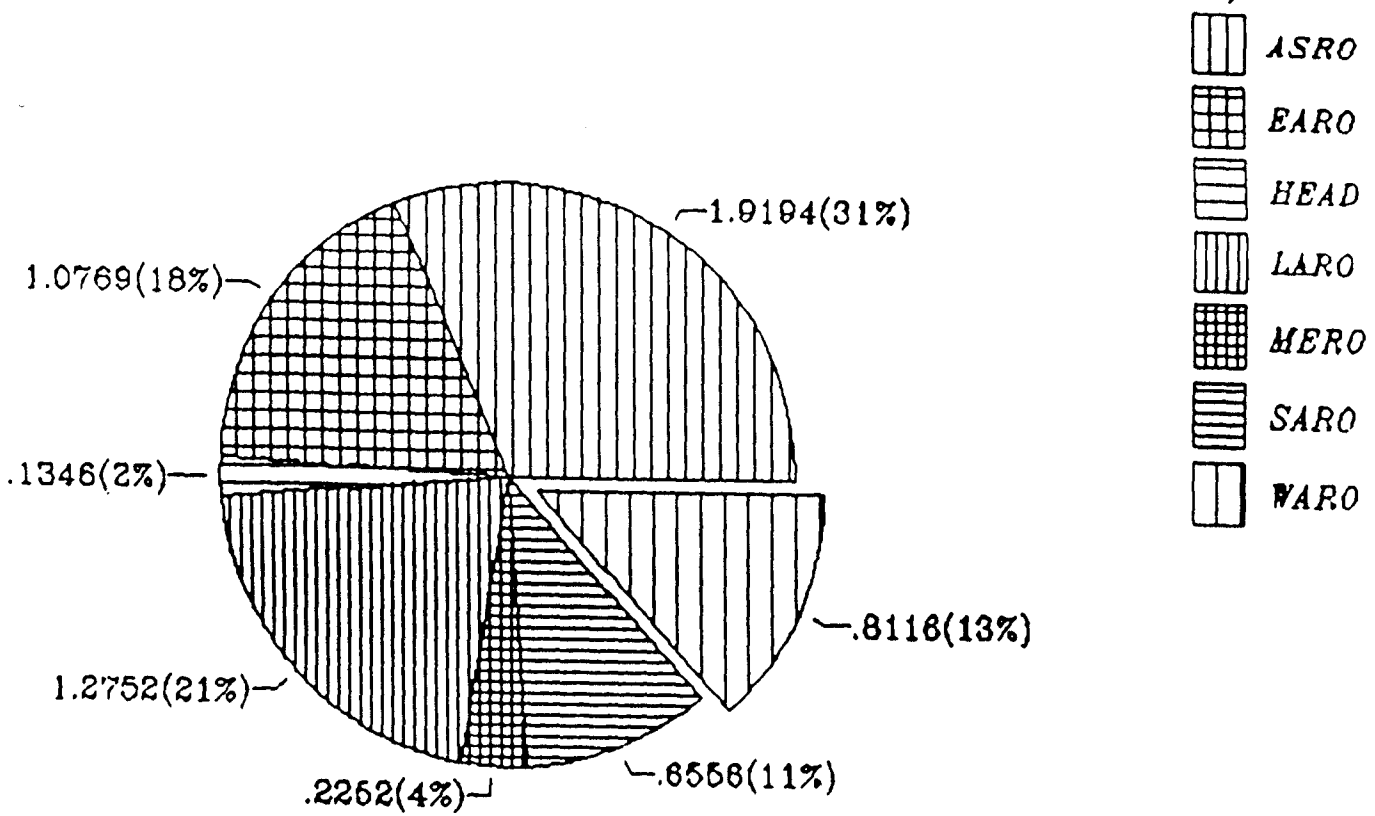


Figure 3: Allocation of grant funds during the International Water Supply and Sanitation Decade.

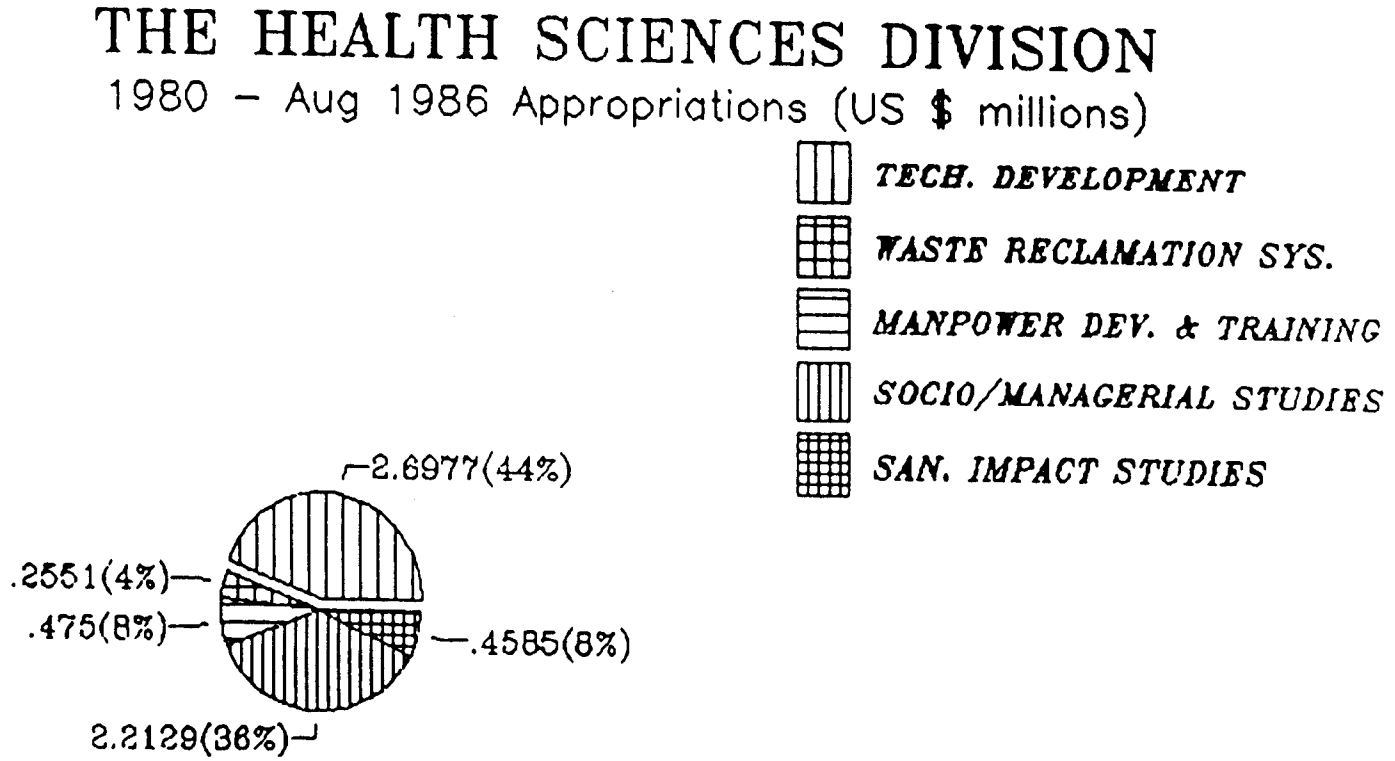
THE HEALTH SCIENCES DIVISION

1980 – Aug 1986 Appropriations by Region (US $ millions)



Water Supply and Sanitation Sector

Figure 4: Allocation of grant funds to IDRC's seven geographical regions: Asian Region (ASRO); East African Region (EARO); North America (HEAD); Latin American Region (LARO); Middle East and North African Region (MERO); South Asian Region (SARO);and the West African Region (WARO).



Water Supply and Sanitation Subsectors

Figure 5: Allocation of grant funds during the International Water Supply and Sanitation Decade among the Water Supply and Sanitation Sectors five program areas.

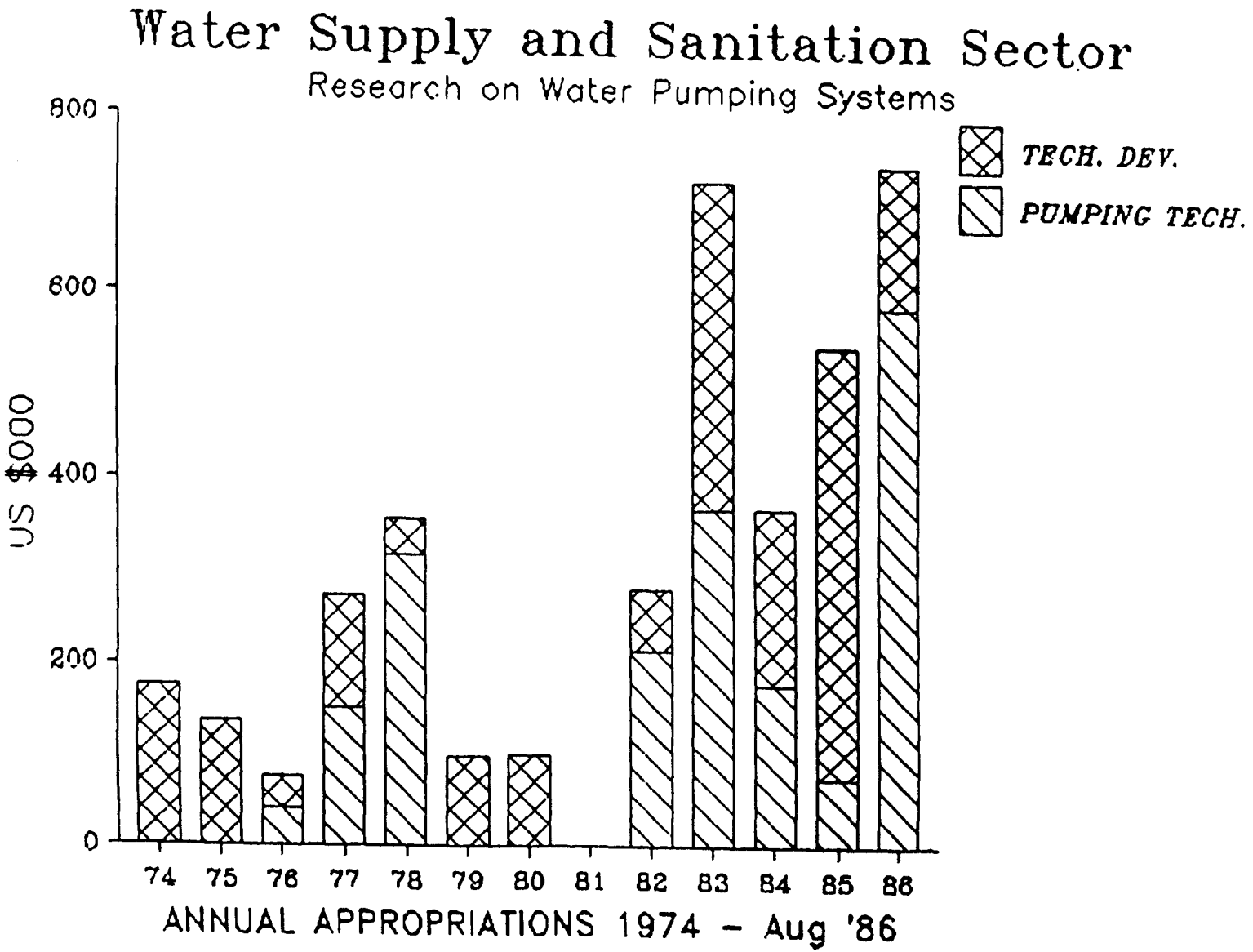


Figure 6: Allocation of grant funds for projects dealing with the development of new or improved technologies and specifically, water pumping technologies such as hydraulic rams and handpumps.